

# Exhibit 25

IN THE UNITED STATES DISTRICT COURT  
FOR THE SOUTHERN DISTRICT OF WEST VIRGINIA  
CHARLESTON DIVISION

B.P.J. by her next friend and mother, HEATHER JACKSON,

*Plaintiff,*

v.

WEST VIRGINIA STATE BOARD OF EDUCATION, HARRISON COUNTY BOARD OF EDUCATION, WEST VIRGINIA SECONDARY SCHOOL ACTIVITIES COMMISSION, W. CLAYTON BURCH in his official capacity as State Superintendent, DORA STUTLER in her official capacity as Harrison County Superintendent, and THE STATE OF WEST VIRGINIA,

*Defendants,*

and

LAINY ARMISTEAD,

*Defendant-Intervenor.*

Civil Action No. 2:21-cv-00316

Hon. Joseph R. Goodwin

**REBUTTAL EXPERT REPORT AND DECLARATION OF  
JOSHUA D. SAFER, MD, FACP, FACE**

1. I have been retained by counsel for Plaintiff as an expert in connection with the above-captioned litigation.

2. My background and credentials are set forth in my previous expert report and declaration dated January 21, 2022 (“Safer Rep.”). I incorporate all conclusions and facts set forth in my previously submitted report into this rebuttal report as if fully stated herein.

3. I reviewed the expert reports of Gregory A. Brown, Ph.D. and Chad. A. Carlson, M.D., submitted in this case on February 23, 2022 (“Brown Rep.” and “Carlson Rep.”). I provide

this rebuttal report to explain the overall problems with the conclusions they draw and provide data showing why such conclusions are in error. I reserve the right to supplement my opinions in response to new information if necessary as the case proceeds.

### **SUMMARY OF OPINIONS**

4. In this rebuttal report, I address four topics raised in the expert reports of Dr. Brown and Dr. Carlson that are related to this lawsuit.<sup>1</sup>

- a. H.B. 3293's definition of "biological sex" as "reproductive biology and genetics at birth" is inaccurate and misleading. Especially in the context of transgender people or people with intersex characteristics, "biological sex" includes all the biological components of sex, including hormones and the biological underpinnings of gender identity.
- b. Circulating testosterone is the primary known biological driver of average differences in athletic performance, not "reproductive biology and genetics at birth." Differences in athletic performance between cisgender boys and girls before puberty are minor and cannot reliably be attributed to biological factors instead of social ones.
- c. Concerns about athletic advantage do not provide a scientific basis for H.B. 3293's categorical ban of transgender girls and women from all girls' teams sponsored by

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<sup>1</sup> It is my understanding that H.B. 3293 seeks to exclude girls and women who are transgender if they are a student at a secondary school or institution of higher education in West Virginia. As a result, several of the studies discussed and conclusions reached by Dr. Brown and Dr. Carlson in their reports are unrelated to H.B. 3293 (e.g., discussions regarding elite athletes, such as Olympians). Although there are several issues with Dr. Carlson's and Dr. Brown's statements regarding these inapposite studies and the conclusions they reach are nothing more than conjecture, given that these studies are not related to H.B. 3293, I do not exhaustively respond to each inaccurate or misleading statement here.

a secondary school or institution of higher education in West Virginia. There is no basis to expect that transgender girls who receive puberty delaying medication followed by gender affirming hormones would have an athletic advantage, and Dr. Brown's sweeping arguments about an athletic advantage for transgender women who suppress testosterone after puberty are based on supposition and conjecture, not evidence.

- d. Concerns about safety also do not provide a scientific basis for H.B. 3293's categorical ban of transgender girls and women from all girls' teams sponsored by a secondary school or institution of higher education in West Virginia. Dr. Carlson's speculative arguments about safety risks apply only to contact and collision sports, and actual safety concerns can be addressed through even-handed rules instead of discriminating based on transgender status.

**H.B. 3293'S DEFINITION OF "BIOLOGICAL SEX"  
IS INACCURATE AND MISLEADING**

5. Ignoring all the other biological components of sex, H.B. 3293 defines "biological sex" exclusively as "an individual's physical form as a male or female based solely on the individual's reproductive biology and genetics at birth." As I explained in my initial report, however, the phrase "biological sex" is an imprecise term that can cause confusion, especially in the context of transgender people and people with intersex characteristics. A person's sex encompasses the sum of several different biological attributes, including sex chromosomes, certain genes, gonads, sex hormone levels, internal and external genitalia, other secondary sex characteristics, and the biological underpinnings of gender identity. Those attributes are not always aligned in the same direction. See Hembree WC, et al. *Endocrine Treatment of Gender-Dysphoria/Gender Incongruent Persons: An Endocrine Society Clinical Practice Guideline*. J Clin

Endocrinol Metab 2017; 102:3869–3903 (“Endocrine Society Guidelines 2017”) at 3875; Safer JD, Tangpricha V. *Care of Transgender Persons*. N Engl J Med 2019; 381:2451-2460 (“N Engl J Med 2019”).

6. In response to my initial report, Dr. Brown states that sex is rooted in biology. (Brown Rep. ¶¶ 1-3). I agree. But the fact that sex is rooted in biology does not mean that sex is defined exclusively by genetics or reproductive biology at birth. As reflected in the same sources cited by Dr. Brown, dimorphous sexual characteristics in men and women are produced by a combination of genes, prenatal androgen exposure to sex hormones, epigenetics and other environmental factors. Bhargava, A. et al. *Considering Sex as a Biological Variable in Basic and Clinical Studies: An Endocrine Society Scientific Statement*. Endocr Rev. 2021; 42:219-258 (“Bhargava 2021”) at 221-228; N Engl J Med 2019; Safer JD, Tangpricha V. *Care of the Transgender Patient*. Ann Intern Med 2019; 171: ITC1-ITC16 (“Ann Intern Med 2019”).

7. In addition, although the precise biological causes of gender identity are unknown, gender identity itself has biological underpinnings, possibly as a result of variations in prenatal exposure to sex hormones, gene sequences, epigenetics, or a combination of factors. And when transgender people receive puberty-delaying treatment and gender-affirming hormones, they develop other biological and physiological sex characteristics that align with their gender identity and not with their sex recorded at birth. Endocrine Society Guidelines 2017 at 3874-75, 3888-89; Bhargava 2021 at 227; N Engl J Med 2019; Ann Intern Med 2019.

#### **THE PRIMARY KNOWN BIOLOGICAL DRIVER OF AVERAGE DIFFERENCES IN ATHLETIC PERFORMANCE IS CIRCULATING TESTOSTERONE**

8. As explained in my previous report, the primary known biological cause of average differences in athletic performance between non-transgender men as a group and non-transgender women as a group is circulating testosterone—not “reproductive biology and genetics at birth.”

The existing “evidence makes it highly likely that the sex difference in circulating testosterone of adults explains most, if not all, of the sex differences in sporting performance.” *See Handelsman DJ, et al. Circulating Testosterone as the Hormonal Basis of Sex Differences in Athletic Performance. Endocrine Reviews* 2018; 39:803-829 (“Handelsman 2018”) at 823 (summarizing evidence rejecting hypothesis that physiological characteristics are driven by Y chromosome).<sup>2</sup>

9. Neither Dr. Brown nor Dr. Carlson disputes that circulating testosterone is the largest biological driver of average differences in athletic performance (Brown Rep. ¶ 114; Carlson Rep. ¶ 16), but Dr. Brown contends that cisgender boys and transgender girls have at least some biological advantages in athletic performance over cisgender girls even before puberty. In support, Dr. Brown relies primarily on demographic data from physical fitness tests or athletics in which prepubertal cisgender boys have outperformed prepubertal cisgender girls. But there is no reliable basis for Dr. Brown to attribute those differences to biology instead of social factors such as greater societal encouragement of athleticism in boys, greater opportunities for boys to play sports, or different preferences of the boys and girls surveyed. *See Handelsman DJ. Sex Differences in Athletic Performance Emerge Coinciding with the Onset of Male Puberty. Clin Endocrinol (Oxf)*. 2017;87(1):68–72 (“Handelsman 2017”).

10. Dr. Brown also points out that there are physiological differences between cisgender boys and cisgender girls before puberty, largely as a result of exposure to hormones in

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<sup>2</sup> Dr. Brown cites to Handelsman in his report but continually misrepresents Handelsman’s findings, notably omitting key portions of the reference. For example, Dr. Brown writes, “[t]here is convincing evidence that the sex differences in muscle mass and strength are sufficient to account for the increased strength and aerobic performance of men compared with women and is in keeping with the differences in world records between the sexes.” (Brown Rep. ¶ 55, citing Handelsman 2018). But Dr. Brown omits the following sentence which explains that “[t]he basis for the sex difference in muscle mass and strength *is the sex difference in circulating testosterone*.” (Handelsman 2018 at 816) (emphasis added).

utero or during infancy. (Brown Rep. ¶ 71 (citing McManus, A. and N. Armstrong, *Physiology of Elite Young Female Athletes*. J Med & Sport Sci 2011; 56:23-46)). But the article cited by Dr. Brown never draws a causal connection between those physiological differences and any differences in athletic performance between cisgender prepubertal boys and girls. Throughout the article, McManus and Armstrong acknowledge that differences between cisgender prepubertal boys and girls in various measurements are minimal or nonexistent. *See Id.* at 24 (“Prior to 11 years of age differences in average speed are minimal”); at 27 (“small sex difference in fat mass and percent body fat are evident from mid-childhood”); at 29 (“bone characteristics differ little between boys and girls prior to puberty”); at 32 (“There is little evidence that prior to puberty pulmonary structure or function limits oxygen uptake”); at 34 (“[N]o sex differences in arterial compliance have been noted in pre- and early- pubertal children”).

11. There is also no basis to confidently predict that patterns about the athletic performance of prepubertal cisgender boys will be the same for prepubertal transgender girls. To the extent that differences in performance are influenced by social influences, biases, or preferences, the experience of transgender girls might be more similar to the experience of cisgender girls than to cisgender boys. And to the extent that differences in performance are shown to have some connection to epigenetics or exposure to sex hormones in utero or infancy, we do not know whether those biological factors are always equally true for transgender girls in light of scientific studies documenting potential biological underpinnings of gender identity.

12. For example, studies have shown that even before initiating hormone therapy transgender women tend to have lower bone density than cisgender men. Van Caenegem E, Taes Y, Wierckx K, Vandewalle S, Toye K, Kaufman JM, et al. *Low Bone Mass is Prevalent in Male-to-Female Transsexual Persons Before the Start of Cross-Sex Hormonal Therapy and*

*Gonadectomy*. Bone 2013;54(1):92–7. We do not know whether those differences are explained by social factors or biological ones. But regardless of the cause, it cannot be assumed that the physiological characteristic of cisgender boys and men will automatically apply to transgender girls and women even in the absence of gender affirming hormones.

**CONCERNS ABOUT ATHLETIC ADVANTAGE  
DO NOT PROVIDE A SCIENTIFIC BASIS FOR H.B. 3293**

13. In my previous report, I explained why “[t]here is no medical justification for West Virginia’s categorical exclusion of girls who are transgender from participating in scholastic athletics on the same teams as other girls.” (Safer Rep. ¶ 46). By excluding girls who are transgender based on “biological sex,” and defining that term to mean “reproductive biology and genetics at birth,” West Virginia categorically prevents girls who are transgender from participating on all girls’ teams sponsored by a secondary school or institution of higher education in West Virginia regardless of the particular sport at issue and regardless of whether they are pre-pubertal, receiving puberty blockers, or receiving gender-affirming hormone therapy. That sweeping and categorical ban is dramatically out of step with even the most stringent policies of elite international athletic competitions for girls and women who are transgender.

14. To support this sweeping ban, Dr. Brown makes a variety of claims that are either irrelevant or are based on speculation and inferences that are not supported by the data that we currently have.

15. As an initial matter, Dr. Brown provides no scientific support for excluding girls and women who are transgender and who had puberty blockers before endogenous puberty. To the contrary, even some of the most exclusionary policies cited by Dr. Brown allow transgender girls and women to participate if they did not experience endogenous puberty. *See* World Rugby Transgender Women’s Guidelines 2020 (“Transgender women who transitioned pre-puberty and



have not experienced the biological effects of testosterone during puberty and adolescence can play women's rugby").<sup>3</sup>

16. Dr. Brown contends that "there is no published scientific evidence that the administration of puberty blockers to males before puberty eliminates the pre-existing athletic advantage that prepubertal [transgender girls] have over prepubertal [cisgender] females." (Brown Rep. at 56). But as I explain above, there is no evidence that prepubertal transgender girls have any such pre-existing biological athletic advantages. *See supra* ¶¶ 9-12.

17. Dr. Brown's assertions also rest on a misunderstanding of the treatment of gender dysphoria. Indeed, Dr. Brown admits that his speculation about puberty blockers is outside his area of expertise. (Brown Rep. ¶ 110). Under current standards of care, transgender adolescents are eligible to receive puberty blockers when they reach Tanner 2—not Tanner 3—which is early enough to prevent endogenous puberty from taking place. *See* Endocrine Society Guidelines 2017 at 3869-3903. Following administration of puberty blockers, transgender girls and women will have also received gender-affirming care to allow them to go through puberty consistent with their female gender identity. As a result of a typically female puberty, these transgender girls and women will develop many of the same physiological and anatomical characteristics of cisgender girls and women, including bone size (Brown Rep. ¶¶ 46-48), skeletal structure (*id.* at ¶ 49), and "distinctive aspects of the female pelvis geometry [that] cut against athletic performance" (*id.* at ¶ 50). Thus, a transgender girl or women who received puberty blockers followed by gender-affirming hormones does not have the same physiology as a prepubertal cisgender boy.<sup>4</sup>

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<sup>3</sup> *See* <https://www.world.rugby/thegame/player-welfare/guidelines/transgender/women>

<sup>4</sup> Dr. Brown cites to a study measuring body composition among transgender people who received puberty delaying medication followed by gender affirming hormones. (Brown Rep. ¶¶ 112-13 (citing Klaver M, et al. *Early Hormonal Treatment Affects Body Composition and Body Shape in*

18. Dr. Brown also cannot point to data justifying H.B. 3293's exclusion of transgender girls and women who experience endogenous puberty and then lower their levels of circulating testosterone. As I explained in my original report, concerns about athletic competition among college students and adults are more attenuated for students in middle school and high school, where athletes' ages typically range from 11-18, with different athletes in different stages of pubertal development. Increased testosterone begins to affect athletic performance at the beginning of puberty, but those effects continue to increase each year of puberty until about age 18, with the full impact of puberty resulting from the cumulative effect of each year. As a result, a 14, 15, or 16-year old has experienced less cumulative impact from testosterone than a 17 or 18-year old.

19. But even with respect to college students, Dr. Brown's sweeping arguments are not supported by his data. There have been only two studies that examined the effects of gender-affirming hormone therapy on the athletic performance of transgender female athletes. (Safer Rep. ¶¶ 55-57). The first is a small study of eight adult long-distance runners showing that when women who are transgender have lowered circulating testosterone, their performance when compared to non-transgender women was proportionally the same as their performance had been before treatment relative to non-transgender men. Harper J. *Race Times for Transgender Athletes*. *Journal of Sporting Cultures and Identities* 2015; 6:1-9. The second is a retrospective study that reviewed military fitness test results, showing that two years of gender-affirming hormone therapy negated any advantage transgender women had over non-transgender women in performing push-ups and

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*Young Transgender Adolescents*. *J Sex Med* 2018; 15: 251-260)). This study confirms that the transgender women after treatment had body composition patterns that more closely resembled cisgender women than cisgender men (or cisgender prepubertal boys). The minimal remaining differences reported in some measurements are not large enough to plausibly confer a material athletic advantage, and those differences are likely attributable to the fact that the subjects do not appear to have started receiving treatments until ages 12.8 to 13.5 at the earliest. By contrast, the start of Tanner 2 for transgender girls usually begins at about age 11.5.

sit-ups, but did not completely negate transgender women's faster times in racing 1.5 miles. Roberts TA, et al. *Effect of gender affirming hormones on athletic performance in transwomen and transmen: implications for sporting organizations and legislators*. Br J Sports Med. 2020; 0:1–7. doi:10.1136/bjsports-2020-102329.

20. Neither of these studies provides enough data to support Dr. Brown's sweeping claim that transgender women who have lowered circulating testosterone have an advantage over cisgender women in all athletic events. To support that inference, Dr. Brown cites to a variety of studies of transgender women measuring discrete physiological characteristics such as muscle size or grip strength. (Brown Rep. ¶¶ 153-56). Dr. Brown predicts that if puberty-influenced characteristics like bone and muscle size are not completely reversed by testosterone suppression, then those characteristics will continue to provide an advantage for transgender women. But because changes in testosterone affect different parts of the body in different ways, we do not have enough information to confidently predict whether the combined effect of the changes will be an advantage or a disadvantage.

21. The study about military fitness tests (Roberts 2020) illustrates the point. Roberts TA, et al. *Br J Sports Med*. 2020; 0:1–7. After two years of suppressing testosterone any advantage that the transgender women had in performing push-ups or sit-ups was eliminated. But because the transgender women in the study weighed more than the cisgender women even after suppressing testosterone, the transgender women had to use more muscle strength to perform the same number of push-ups. In other words, the transgender women may have had more muscle strength, but that greater strength did not translate into an athletic advantage in a push-up contest. Because different sports require different types of physical performance, the existence and extent

of any performance advantage based on grip strength or leg-muscle size may vary from sport to sport and cannot support a categorical across-the-board rule.

22. Dr. Brown also refers to widely publicized anecdotes about isolated cases of transgender girls and women winning state championships in high school sports or NCAA championships in college. But transgender athletes and women have been competing in NCAA and secondary school athletics for many years at this point, and they remain dramatically underrepresented amongst champions. The occasional championships that have been widely publicized do not come close to constituting the rates one would expect if they won at rates that are proportional to their overall percentage of the population (which is approximately 1%).

**CONCERNS ABOUT SAFETY DO NOT PROVIDE  
A SCIENTIFIC BASIS FOR H.B. 3293**

23. Dr. Carlson argues in his report that allowing transgender girls and women to participate on women's teams "creates significant additional risk of injury for the [cisgender] female participants competing alongside these transgender athletes." (Carlson Rep. at 2).

24. Even on their own terms, none of Dr. Carlson's arguments support H.B. 3293's categorical ban of all girls who are transgender from all girls' sports teams. Dr. Carlson's safety arguments relate solely to contact and collision sports and to physical characteristics developed during puberty. By contrast, H.B. 3293 applies even to non-contact sports like cross-country, and it applies even to transgender girls and women who have never experienced endogenous puberty as a result of hormone blocking medication and gender-affirming hormones.<sup>5</sup>

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<sup>5</sup> The declaration Dr. Carlson submitted earlier in this case dealt exclusively with physiological characteristics acquired during puberty. In his more recent report, Dr. Carlson vaguely asserts that "the conclusions of this paper can apply to a certain extent before . . . puberty" (Carlson Rep. at 56) but he does not attempt to argue that the relatively small differences in performance or physiology observed before puberty come anywhere close to creating an actual safety risk.

25. To the extent that Dr. Carlson's arguments related to some applications of H.B. 3293, those arguments are based on stereotypes and suppositions, not actual evidence that transgender girls and women pose a safety threat. Although transgender girls and women have been playing in NCAA and secondary school sports for at least the past 10 years, Dr. Carlson does not identify any instance in which a cisgender girl or woman has actually been injured as a result of competing against a girl or woman who is transgender. Rather, he theorizes that a greater number of people are identifying as transgender and that sporting organizations should adopt restrictions preemptively in response to what he characterizes as "this rapid social change." (Carlson Rep. at 59).

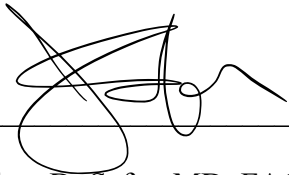
26. Dr. Carlson repeats the same mistakes as Dr. Brown by drawing unsubstantiated inferences about transgender women based on data from cisgender men and from measurements of discrete characteristics. As discussed above, we do not currently have sufficient information to predict how all the physiological effects of testosterone suppression will interact in combination each other or whether they will produce the same kinetic energy as typically produced by cisgender men. For instance, having larger bones without corresponding levels of testosterone and muscle mass would mean that a runner has a bigger body to propel with less power to propel it.

27. Dr. Carlson does not offer a cogent explanation for why alleged safety concerns based on average differences in size and strength should be addressed with an across-the-board exclusion of transgender women as opposed to tailored, non-discriminatory policies. Like Dr. Brown's arguments about athletic advantage, Dr. Carlson's arguments about safety must be considered in the context of all the intra-sex variations in height, weight, and muscle mass that pose comparable safety risks. Athletic organizations can protect athlete safety for women without drawing categorical lines based on transgender status.

**CONCLUSION**

I declare under penalty of perjury under the laws of the United States of America that the foregoing is true and correct.

Executed on 3/10/2022

  
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Joshua D. Safer, MD, FACP, FACE